

bow of much feebler light, and whose distance from the sun is 126–130°. Three reflections within the drop give a rainbow whose radius is 41° from the sun. Four reflections give the quaternary rainbow whose radius is 44° from the sun. Five reflections give a halo whose radius is 126°. It is only under the most favorable circumstances that any fragments of the third and fourth rainbows can be seen owing to their faintness. Moreover, if the drops are not perfectly spherical these rainbows will appear in some other location than that just given. It does not seem likely that the bit of rainbow seen at Chicago on May 2 was due to reflection and refraction from crystals of ice, but rather from small drops of water, and that it was in fact a case of the visibility of the tertiary rainbow at 41° from the sun. This particular rainbow is not likely to occur in winter, but is then replaced by the various halos formed by ice crystals, as explained in the MONTHLY WEATHER REVIEW for July, 1897.

METEOROLOGY IN CHILE.

A recent letter from Mr. J. Munor Hustady, Director of the Meteorological and Magnetic services of the Bureau of Maritime Territory, Navy Department, Republic of Chile, informs us that the publication of the meteorological observations, taken by the various observatories established on the coast of that country, began with the volume for 1899, and that the two following years have also been published. These three volumes contain the original record of observations three times daily, at the following stations; mostly light-houses:

Station.	Latitude, south.	Longitude, west.	Altitude.
	°	°	Meters.
Iquique (Island of Serrano)	20	70	9
Caldera	27	70	23
Island of Chanaral	29	71	48
Tortuga (Coquimbo)	30	71	26
Anjeles (Valparaiso)	33	72	41
Juan Fernandez	34	79	10
Carranza	36	73	33
Tumbes	37	73	91
Santa Maria	37	73	65
Western Mocha	38	74	18
Eastern Mocha	38	74	32
Niebla	40	73	43
Galera	40	74	38
Ancud	42	74	48
The Evangelists	52	75	53
Dungeness	52	68	3

For these sixteen stations, substituting others if one is missing, the three volumes give the same data as far as practicable, viz: the full record day by day of pressure, temperature, wind, relative humidity, cloudiness, and rainfall, as also the monthly summaries of the same observations and, in some cases, of even more frequent observations; namely, the trihourly record for midnight, 3, 6, and 9 a. m., and noon, 3, 6, and 9 p. m., except only in the case of Dungeness for 1901. Unfortunately, serious errors occur in the observations of the light-house at Punta Carranza for 1899 and 1900, but the remaining records seem to be satisfactory. This is, we believe, the first time that complete daily records from South American stations have become accessible to meteorologists.

In addition to the above contribution by the navy, we note that the Astronomical Observatory at Santiago, founded in 1860, has published three volumes of its Annual. The Director, Prof. A. Obrecht, in the first volume of the Anuario, publishes a long memoir on the theory of lunisolar precession, followed by the determination of the latitude and longitude of the observatory, and another on the determination of the force of gravity; and there is a third memoir, by J. Taulis. The volume concludes with the chapter on the meteorology of Santiago de Chile, giving a general summary of the observations made since 1860, and also the monthly mean values, by A. Krahnass, who has had charge of the section of meteorology since October, 1891.

These three volumes form a continuation of the three issued in 1887, or earlier, by Señor I. Vergara, then director of the observatory.

The second volume begins with a photographic method for determining the movement of the terrestrial pole. This is followed by a discussion of the magnetic observations, and that by the table of geographic coordinates.—C. A.

EARTHQUAKES IN CALIFORNIA.

[Reported by Prof. A. G. MCADIE.]

Although the subject of earthquakes belongs to geology rather than climatology, the Weather Bureau offices in the State of California have kept a record of shocks during the last few years, and published the results of 1897, 1898, 1899, and 1900 in the bulletin upon the climatology of the State. The Bureau records show that there is no relation between earthquakes and weather, although there is a well-defined belief among the older residents of California that earthquakes are preceded by a spell of sultry weather, and this is even known as "earthquake weather." Some of the most severe earthquakes have occurred when the conditions of weather were in nowise those which are said to be characteristic of quakes.

THE DURATION AND RATE OF RAINFALL.

In the Quarterly Journal of the Royal Meteorological Society, July, 1903, Mr. Joseph Baxendell discusses the records of rainfall obtained by self-registering gages at several stations in England.

At the Fernley Observatory, at Southport, a Halliwell gage was used by Mr. Baxendell himself. The total annual rainfall for 1902 was 25.42 in 199 days, or 640.1 hours, giving an annual mean of 0.0397 inch per hour.

At Croydon Mr. Baldwin Latham used the extensive self-recording gage of his own design, which gave 20.665 inches in 529.35 hours, or a mean annual rate of 0.0390, but this latter rate is abnormally low for Croydon, where the average for four years is 0.0650, for 1879–1882, and, again, 0.0574 for the four years 1898–1901. Mr. Latham also keeps in use one of Halliwell's gages, which furnishes records of equal accuracy.

Mr. Baxendell adds:

The various self-recording rain gages hitherto in use, however, have unfortunately afforded little assistance in this direction, for most of them either (a) have their rims placed at a height of, at any rate, some feet above the ground, which, as instanced below, may vitiate the record of duration to a surprising extent, or (b) give "step-by-step" records, quite useless for this purpose, or (c) are designed to record on a far too contracted scale to render it practicable to deduce from their traces the duration of light rains with anything approximating to accuracy, while all are usually, in practise, more or less affected by friction and few contain any satisfactory provision for melting snow as it falls. The isolated annual durations of rainfall that are published frequently differ 10 per cent from the truth.

In illustration of this last statement, Baxendell quotes a comparison between gages, some of which appear to have less friction than others, while some are higher than others. It is not quite evident that any gage can give us the absolute truth as compared with hourly personal observations by a large corps of observers.—C. A.

THE CAPACITY OF THE AIR FOR AQUEOUS VAPOR.

The Editor frequently has occasion to revise or "edit" the manuscript that is sent him for publication. It follows that he sometimes becomes painfully conscious of the extent to which erroneous views are still held by some of the best men in the service. As one of the fundamental objects of the MONTHLY WEATHER REVIEW is the dissemination of sound views in meteorology and the general education of both regular and